Project Introduction

NanoSonic has developed revolutionary multifunctional, super lightweight, self-healing and radiation shielding carbon fiber reinforced polymer (CFRP) composites as a viable lightweight material for space applications such as primary or secondary structures on NASA vehicles, habitat modules, and pressure vessel structures. While current composites are lightweight, they do not offer reliable methods for damage inspection. These advanced materials offer the ability to self-heal upon impact and allow for micro crack damage inspection via DC or RF measurements. During the Phase I program, this phenomenon was demonstrated on multifunctional smart structural composites consisting of: carbon fiber plies, NanoSonic's Thoraeus Rubber™ Kevlar Lightweight Shieling Veils (LSV), and our conductive self-healing microcapsules. The innovative microcapsules are comprised of a corrosion resistant HybridShield polymer shell, a resin-rich core of self-repairing, room temperature curing polymer, and Al nanoparticles to impart EMI and radiation shielding as well as a conductive pathway between the conductive Thoraeus Rubber veils to monitor both damage and repair via RF measurements. NanoSonic is working with Colorado State University, ILC Dover, and Lockheed Martin Space Systems Company to increase the TRL of this technology from 5-7 during the Phase II program via mechanical, RF, and radiation shielding measurements and space qualification testing.

Primary U.S. Work Locations and Key Partners

Multifunctional Shielding and Self-Healing HybridSil Smart Composites for Space, Phase II Briefing Chart Image

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Multifunctional Shielding and Self-Healing HybridSil Smart Composites for Space, Phase II
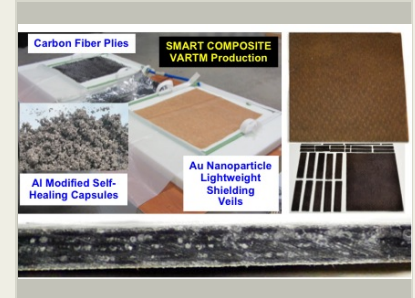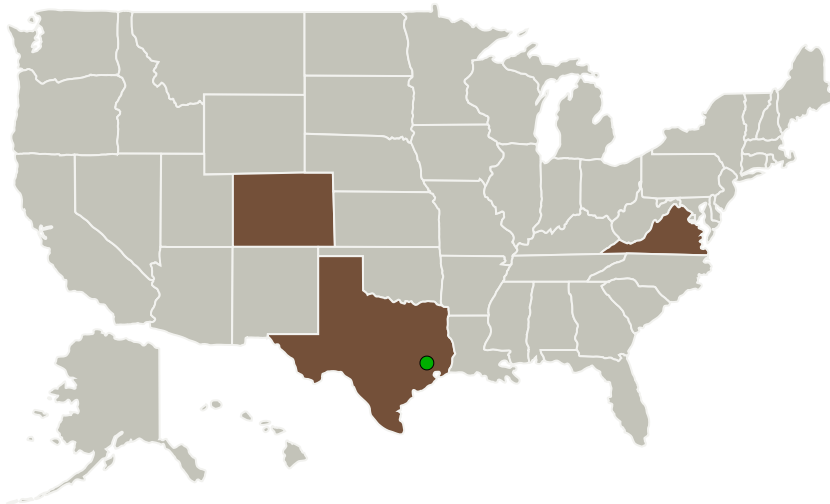
Completed Technology Project (2015 - 2017)

Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
Colorado State University-Fort Collins	Supporting Organization	Academia	Fort Collins, Colorado
🟢Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Colorado	Texas
Virginia	

Project Transitions

▶ **May 2015:** Project Start

✔ **June 2017:** Closed out

   Closeout Documentation:
   - Final Summary Chart*(https://techport.nasa.gov/file/137658)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Nanosonic, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
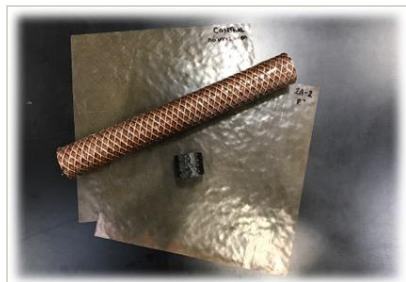Jennifer Lalli

Co-Investigator:
Jennifer Lalli

Images

Briefing Chart Image
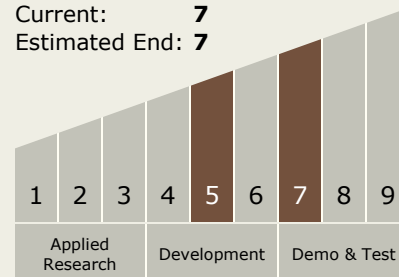Multifunctional Shielding and Self-Healing HybridSil Smart Composites for Space, Phase II Briefing Chart Image
(https://techport.nasa.gov/image/136987)

Final Summary Chart Image
Multifunctional Shielding and Self-Healing HybridSil Smart Composites for Space, Phase II Project Image
(https://techport.nasa.gov/image/132852)

Technology Maturity (TRL)

Start: **5**
Current: **7**
Estimated End: **7**

1	2	3	4	5	6	7	8	9
Applied Research				Development		Demo & Test		

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  └ TX12.1 Materials
    └ TX12.1.1 Lightweight Structural Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System

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For more information and an accessible alternative, please visit:
https://techport.nasa.gov/view/33455

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